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abbreviation "spp." which refers to species (plural) of *Parthenium* was discussed. The Examiner also clarified that the word "not" in the last sentence of paragraph 3 was "now."

**The Amendment**

Claims 1, 3, 4, 6, and 16 have been amended to replace the term "spp." with the term "species" as requested by the Examiner. Since spp. is the abbreviation for the term species (plural), this amendment does not change the scope of the claimed invention.

The amendment does not introduce new matter.

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Applicants seek reconsideration of their application on the basis of the foregoing amendment and the discussion that follows.

**Rejection of the Abbreviation Spp.**

Claims 1, 3, 4, 6, and 16 have been amended to replace the term "spp." with the term "species" as requested by the Examiner. As noted in the record from *The American Heritage® Dictionary of the English Language*, Fourth Edition, 2000 by Houghton Mifflin Company which was provided with Applicants' Amendment filed July 16, 2002 and which is incorporated herein by reference, the term "spp." is the abbreviation for the term "species" (plural). This is also clear from paragraph [0027], page 7, of Applicants' specification. Thus, this amendment does not change the scope of the claimed invention.

During the January 22, 2003 phone interview the Examiner clarified that the rejection of Claim 16 has been withdrawn.

In view of the foregoing, it is submitted that Claims 1, 3, 4, 6, and 16 are in condition for allowance.

**Rejection Under 35 U.S.C. 103**

Claims 1-19 stand rejected under 35 U.S.C. under 35 U.S.C. 103(a) allegedly as being unpatentable over Kay et al. (U.S. Patent No. 4,647,607) in view of Bultman et al.

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(*Proceedings of 4<sup>th</sup> International Conference*, Dec. 1989, pages 353-356) as set forth in the prior Office Action.

Response

Applicants submit that the prior art, either alone or in combination, does not teach or suggest the critical features which are essential to Applicants' invention.

The rejection was discussed in a phone interview with the Examiner January 22, 2003. Applicants' attorney, the undersigned, discussed that Applicants' claimed invention is directed to wood composites comprising *Parthenium* spp. lignocellulosic plant material and plastic. Lignocellulosic plant material is a woody, fibrous plant material. This is described in the Chapter 13: "How Crops Can Provide Raw Materials for the Chemical Industry," in the *1992 Yearbook of Agriculture: New Crops, New Uses, New Market*, pages 87-92, Office of Publishing and Visual Communication, U.S. Department of Agriculture supplied with Applicants' Amendment filed July 16, 2002, which is incorporated herein by reference.

Applicants' claimed wood-based composites comprising lignocellulosic plant material and plastic are useful for products, such as those used for construction such as lumber, plywood, particleboard, fiberboard, poles, railroad crossties, or the like (in the specification, [0014]). The product obtained is a wood-type product which is obtained using bonding procedures developed for wood composites. The composites have insect, fungal, and other bio-resistant properties.

The *Parthenium* spp. lignocellulosic (woody, fibrous) plant material of applicants' claimed invention can be (a) whole plant material, (b) plant part material, (c) bagasse, or (d) a combination of (a) - (c) [claim 3]; can be plant material that has been processed [claim 4] by a mechanical or chemical reduction process [claim 5] and the processed *Parthenium* spp. plant material may comprise fibers, fiber bundles, particles, flour, chips, flakes, fines, sawdust, pellets, strands, wafers or combinations thereof [claim 6]. As discussed above, products made from composites of the invention can be used to make

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numerous items, particularly those used for construction such as lumber, plywood, particleboard, fiberboard, poles, railroad crossties, or the like.

In addition, Applicants found the surprising results that the composites of the invention have excellent termite resistance and decay resistance by **direct use of *Parthenium* spp.** whole plant, plant parts or bagasse material to make the *Parthenium* spp.-plastic composites of the invention. That is, termite and fungus-resistant products were obtained while **avoiding the need to extract the natural resin from *Parthenium* spp.**" (in the specification, [0012], emphasis added).

In contrast, Kay et al. (U.S. Patent No. 4,647,607), the primary reference cited by the Examiner, teaches use of **extracted guayule resin** (col. 1, lines 49 to 54; col. 3, lines 1-37; col. 4, line 39 to col. 5, line 5; col. 6, lines 23-28) as a thermooxidative stabilizer (Abstract, and col. 1, line 12) for a synthetic elastomer (col. 2, lines 26-28 and 38-41), e.g., rubber. The extraction of the guayule resin is carried out using a polar solvent. The extracted guayule resin is mixed with synthetic rubber which is obtained by emulsion or hydrocarbon solvent techniques using polar solvents.

The extracted guayule resin of Kay et al. does not teach, disclose or suggest a lignocellulosic (woody, fibrous) material. The extracted guayule resin of Kay et al. is totally different from lignocellulosic plant material. As discussed in the Bultman et al. reference, extracted guayule resin is a viscous material and is a free-flowing liquid when heated. During the extraction of guayule to obtain the resin, the resin is separated from the lignocellulosic plant material. Thus, the Kay et al. resin does not disclose lignocellulosic plant material which is an essential element of applicants' claimed invention.

The guayule resin-synthetic rubber product obtained by the process of Kay et al. has utility for the "general uses of synthetic rubber, for example, tires, conveyor belts, roofing membranes, shock absorbers, and various other rubber articles" (col. 4, lines 4-6).

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If one replaced the extracted guayule resin with lignocellulosic material in the Kay et al. process, the utility of Kay et al. would be destroyed.

In sum, the Kay et al. patent is devoid of any teaching or suggestion of the use of *Parthenium* spp. lignocellulosic plant material and plastic to obtain wood-plastic composites useful to make wood products, e.g., lumber, plywood, particleboard, fiberboard, etc., which have resistance to termite infestation and resistance to fungal decay.

The secondary reference does not cure the deficiencies of Kay et al. Applicants submit that the Bultman et al. reference, either alone or in combination with Kay et al., does not teach the critical features essential for Applicants' invention, for the reasons set forth in detail in Applicants' response filed July 16, 2002, which are incorporated herein by reference.

In brief, Bultman et al. describe the use of extracted guayule resin (*Parthenium argentatum*) which is used full-strength to impregnate pine sapwood using a modified Bethel full-cell, vacuum/pressure technique (page 353). To perform this impregnation it was necessary to heat the resin to approximately 70°C to reduce the viscosity sufficiently to obtain a free-flowing liquid. As discussed above, a resin is different from lignocellulose. During the extraction of guayule to obtain the resin, the resin is separated from the lignocellulosic plant material.

The Bultman et al. reference, either alone or in combination with Kay et al., does not teach the critical features essential for Applicants' invention. In particular, Bultman et al. do not teach or suggest the use of *Parthenium* spp. lignocellulosic plant material and plastic; do not teach or suggest making wood-plastic composites, and do not describe methods for making wood-plastic composites. Further, there is no teaching or suggestion that wood material having naturally occurring resin would have any termite or resistance properties. Further, Bultman et al. is devoid of any teaching of use of plastic.

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In sum, the critical elements essential for Applicants' invention are not taught or suggested by Bultman et al., alone or in combination with Kay et al.

**There is No Motivation to Combine the References As Suggested by the Examiner**

To support a rejection under 35 U.S.C. 103, there must be some teaching in the prior art that suggests the desirability or incentive to make the modification needed to arrive at the claimed invention. In the instant case, the cited art is devoid of such a teaching to combine the references as suggested by the Examiner. As noted above, neither the Kay et al. patent nor the Bultman et al. reference teaches or suggests use of *Parthenium* spp. lignocellulosic plant material and plastic. In addition, modification of Kay et al. with the teachings of Bultman et al. as suggested by the Examiner would destroy the function of Kay et al. to produce synthetic rubber. This is further evidence of that motivation to combine the two references is lacking. Additionally, as discussed above, the references do not teach or suggest the critical features of Applicants' invention, thus, even if one made the combination of references suggested by the Examiner, one would not obtain the claimed invention.

**The Invention Fulfills a Long-Felt Need; the Invention Provides Unexpected Results**

The composites of the invention fulfill a long-felt need for composites that possess insect, fungal, and other bio-resistant properties. As shown in Applicants' Examples, the composite of the invention showed complete termite resistance (see Table 1, page 25 of the specification), and had better termite resistance compared to Southern pinewood treated with 10.3% or 51.8% extracted, full-strength resin and equal termite resistance compared to Southern pinewood treated with 97% extracted, full-strength resin. This resistance of the invention composition was obtained while avoiding the step of extracting the resin from the *Parthenium* plant. Additionally, the invention provides unexpected results as Applicants' data shows that the composites of the invention made from plant material which contain resin in about 10% natural content in the plant and in the natural state (i.e., unprocessed, unextracted, and not applied at full-strength) appears

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to be better than the extracted, processed, full-strength resin of Bultman et al. because the 10% natural content in the plant is just as effective as the 90% or greater processed resin treatments (see Table 1, page 25 of the specification).

Further, the composite of the invention had greater resistance to decay from *Poria placenta* compared with southern pine wood treated with extracted guayule resin at any level (see Table 3, page 27 of the specification).

In view of the foregoing, Applicants respectfully submit that the cited references do not support an obviousness rejection.

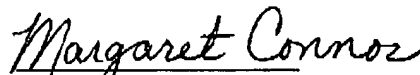
Summary and Conclusions

The claims, as amended, do not have the abbreviation "spp."

None of the cited references taken alone or in combination teach Applicants' invention or suggest an expectation of success of Applicants' claimed invention; thus, the claims are unobvious over the cited art.

If the Examiner has any questions, comments or suggestions, the undersigned attorney earnestly requests a telephone conference.

Respectfully submitted,



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Enclosures:

Appendix I (Marked-up Version Showing the Changes Made)

Appendix II (Clean Version of the Entire Set of Pending Claims Following Entry  
of the Enclosed Amendment)

Facsimile Transmission Cover Sheet

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## APPENDIX I

### MARKED-UP VERSION SHOWING THE CHANGES MADE

Insertions are shown by underlining; deletions are shown by brackets or strike overs.

1. (Twice amended) A composite comprising *Parthenium species spp.* lignocellulosic plant material and plastic.
3. (Once amended) The composite of claim 1, wherein the *Parthenium species spp.* plant material comprises (a) whole plant material, (b) plant part material, (c) bagasse, or (d) a combination of (a) - (c).
4. (Once amended) The composite of claim 1, wherein the *Parthenium species spp.* plant material is processed.
6. (Once amended) The composite of claim 4 wherein the processed *Parthenium species spp.* plant material comprises fibers, fiber bundles, particles, flour, chips, flakes, fines, sawdust, pellets, strands, wafers or combinations thereof.
16. (Twice amended) The composite of claim 1, wherein the *Parthenium species spp.* plant material further comprises (a) lignocellulosic plant material from a plant other than the genus *Parthenium*, (b) added *Parthenium species spp.* natural resin extract or (c) combinations of (a) and (b).

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**APPENDIX II**  
**CLEAN VERSION OF THE ENTIRE SET OF PENDING CLAIMS**  
**FOLLOWING ENTRY OF THE ENCLOSED AMENDMENT**

1. (Twice amended) A composite comprising *Parthenium* species lignocellulosic plant material and plastic.
2. The composite of claim 1, wherein the *Parthenium* species comprises *Parthenium argentatum*, *Parthenium tomentosum* or *Parthenium incanum*.
3. (Once amended) The composite of claim 1, wherein the *Parthenium* species plant material comprises (a) whole plant material, (b) plant part material, (c) bagasse, or (d) a combination of (a) - (c).
4. (Once amended) The composite of claim 1, wherein the *Parthenium* species plant material is processed.
5. The composite of claim 4, wherein the plant material is processed by a mechanical or chemical reduction process.
6. (Once amended) The composite of claim 4 wherein the processed *Parthenium* species plant material comprises fibers, fiber bundles, particles, flour, chips, flakes, fines, sawdust, pellets, strands, wafers or combinations thereof.
7. The composite of claim 1, wherein the plastic is thermoplastic.



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8. The composite of claim 7, wherein the thermoplastic is acrylonitrile-butadiene-styrene; acetal; nylon, including polyamide; high and low density polyethylene, including co-polymers; polypropylene, including co-polymers; polystyrene; or vinyl.

9. The composite of claim 7, wherein the ratio of thermoplastic to plant material ranges by weight from 95% thermoplastic:5% plant material to 5% thermoplastic:95% plant material.

10. The composite of claim 1, wherein the plastic is thermoset.

11. The composite of claim 10, wherein the thermoset is alkyd; allylic; amino, including melamine and urea; epoxy; phenolic; polyester; silicone; or urethane.

12. The composite of claim 10, wherein the ratio of thermoset to plant material ranges by weight from 15% thermoset:85% plant material to 3% thermoset:97% plant material.

13. The composite of claim 1, wherein the plastic is virgin, recycled, or a combination of both virgin and recycled plastic.

14. The composite of claim 1, wherein the composite is made by the air-laying, melt-blending or compression molding method.

15. The composite of claim 1, wherein the composite is particle board or fiberboard.

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16. (Twice amended) The composite of claim 1, wherein the *Parthenium* species plant material further comprises (a) lignocellulosic plant material from a plant other than the genus *Parthenium*, (b) added *Parthenium* species natural resin extract or (c) combinations of (a) and (b).

17. The composite of claim 1, wherein the composite exhibits at least a 30% decrease in termite infestation relative to a composite not containing plant material derived from the genus *Parthenium*.

18. The composite of claim 1, wherein the composite exhibits a rating of resistant or highly resistant to *Gleophyllum trabeum* or *Poria placenta* decay fungi as determined by ASTM standard test D-2017.

19. The composite of claim 1, wherein the composite exhibits a termite resistance rating of high or heavy termite mortality as determined by ASTM standard test D-3345.